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Comdex Fall '97: a look at the future of building systems. (includes related articles on chip development, RISC vs CISC) (Industry Trend or Event)

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President, CNI

WHAT ISSUES confront us as we plan our prepress systems? Is the danger of global domination by Microsoft the most critical one? Should we care about Microsoft's ambition? Why does Janet Reno care? Are we facing a situation resembling the one the automobile manufacturers faced in the '30s and '40s, where a few large companies gained such domination that the Justice Department and unions found it necessary to "protect" us from the Big Bad Six?1

Although it might appear that the Microsoft issue is gaining in importance so fast that it is a critical threat, we at CNI see things a little differently. We see the clouds beginning to part over the computer industry. For the first time, we see things beginning to jell in such a way that it will be easier to plan in the forthcoming years. For the first time, we don't see any major issues that will have a significant effect on how we build prepress systems. Instead, the core technologies are shaping up nicely. The infrastructure for building systems appears to be growing stronger, facing fewer major architectural issues.

This report will attempt to summarize how we arrived at that view and to provide some details on what to expect in the near future. As was the case last year, our opinions are based in large part on the annual Comdex Fall show, where we sent a large crew as observers. The 1997 show served to punctuate a year packed with shows of importance to the publishing industry and the computer industry. Since Comdex also is perhaps the major U.S. showcase for new computing technologies, it also provides a peek ahead at what the next year or two may offer.

Once again, we were not disappointed as we, along with 250,000 others, descended upon Las Vegas in November. (Why don't the Nexpo organizers learn that Las Vegas weather is nice at certain times of the year?) And, we were able to fend off the usual distractions-e.g., the chili cookoff, Kareem Abdul-Jabbar hawking computer products, the useless doodads and trinkets devised to lure customers into booths, the hourlong waits for phones and taxis, the scantily clad women with iridescent green hair enticing visitors and the ubiquitous slot machines that begin their pervasive attacks even before you get to the airport baggage claim.

We should mention that Comdex, as most readers of this publication are aware, is owned by Softbank, the parent organization of Seybold Publications. Hopefully, though, our use of the show to reflect the status of the industry won't be viewed as self-serving. We remind readers that Seybold Publications has used this show as somewhat of a weathervane since long before it was acquired by Softbank a couple of years ago.

The show. The show this year was slightly less crowded than last year. One reason may be that because of the consolidation taking place in both hardware and software, slightly fewer people need to go to Comdex to analyze and make decisions on core technologies.

We also noted a continuation in the trend toward attracting end users, although it is still a good step short of Macworld in this respect. Fortunately, we didn't see anyone hawking computer games, T-shirts or the like, but there was less emphasis on new technology and more on sales of products on the market today.

And there was less networking technology than there used to be, perhaps because there was a major network show-Networld+Interop-in New York two weeks after Comdex, or perhaps because of the slight change in the show's focus. IBM may be thinking along similar lines. In mid-December, IBM announced that it is pulling out of the Comdex show.

Our report. We've organized our report into sections, starting with basic computer technology (e.g., networking, Web connectivity and databases) and following with remote computing, tools and manufacturers, prepress-specific items and other topics.

Network operating systems

The part of the puzzle that is in excellent shape for end users and system integrators is the network (also called the platform) within the walls of an organization. NT Advanced Server continues to gain market share from both Novell and Unix. Whether or not NT ultimately will win this battle outright doesn't matter very much in building and using prepress systems. If NT Advanced Server wins the file server OS war, our lives won't change very much. Similarly, if Unix and Novell continue to thrive, the functionality we attain and how we build systems also won't change very much.

That isn't to suggest, though, that we should ignore this issue. To the contrary, it is critical to think about it for our own decision-making-for reasons that aren't all based on technology. Let's start with the acknowledgment that if one were to start development of a new-generation prepress system today, there is only one network OS to choose-NT Advanced Server. There are many reasons for such a decision. First, in mind share alone, not choosing NT would cause your customers to ask "why not NT?" It would result in a negative checkoff. That may be a poor reason to select a product on which to build a system. And, in fact, Novell and Unix are significantly better developed than NT today (as of Comdex in November), so it would be easier to use them for a system, especially a system that has to run nonstop, as prepress systems do.

NT doesn't yet have the supporting infrastructure that either Unix or Novell has-such as live backup of data and databases. Recovery from and rebuilding of a corrupt database are harder to do with NT than with Unix or Novell networks. However, the infrastructure needed to build a prepress system around NT Advanced Server is rapidly becoming available. (It was interesting that, at Comdex, neither Novell nor Microsoft was talking much about its "fail-over" systems, Wolf Mountain and Wolfpack. It appeared that neither party wanted the other to know the status of the systems' development.)

Let's look at a few other specific examples.

Naming and management services. NT uses Active Directory for managing the enterprise network. One issue with NT today is that managing a multiserver environment requires more manual intervention than is required with a similar Novell network. Novell uses Netware Directory Services. This naming and management scheme is also being pushed hard by Novell for users of NT servers.

It appears that Novell is trying to bolster its market position in the network OS business very much the way Banyon Networks did when Novell took off with the release of Netware 3.11 and 3.12. Until then, Banyon was the choice for larger WANs, with its naming and management scheme (called Vines and Street Talk). Banyon's scheme was far easier to use in managing a multiserver environment. Instead of having to manage names on each server separately, Banyon's Street Talk allowed you to manage names across the WAN. So Banyon appealed to users with larger networks than the original Novell product. Once Novell showed signs of moving upmarket, Banyon "switched rather than fought" and cast its product as a better scheme on top of Novell's print and file sharing services (where Banyon rightly knew it could not win).

In the same way, Novell recognizes-we think-that Microsoft may win, so Novell is hedging its bets. In fact, one would assume that Microsoft finally will get Active Directory right.

At present, with NT you log onto each server in the WAN. With Novell Directory Services, once you have established network rights with one log-on (to one server), you are "on" all the other servers and have appropriate rights and privileges on all servers.

One more thing. NT Advanced Server is modeled on the NT-Windows 95 user interface and desktop OS. In Windows, you can access a particular function in multiple ways. (Think of the printer and page setup in Word, for example, where there are many ways to access the system to change a default setting.) For this reason, when you are running NT as the network OS, there are many ways to get to the middle or core of the OS. This is not necessarily good. End users can more easily get into critical areas and inadvertently do damage. Netware has far better protection in this area.

WAN administration. With NT Advanced Server, you administer the full network from a "master" server. If you lose that server you are in big trouble. Restoration may take time, and in the interim, you may have lost network rights for most of your users. Novell's Directory Services distributes this work through multiple servers, so if you lose the "primary" administrative server you can still operate.

Now, if you take the central network Registry (the map of how all servers and applications relate to each other) and if it is easier to blow this away in NT (with all the access points) then you can see that Netware currently is a "safer" bet. We say this with nine years of experience in supporting 100 newspaper clients. You can be sure that if access is allowed in some fashion, an end user is going to get in accidentally and mess things up.

Novell uses a directory structure that makes duplicate entries impossible because of its hierarchical implementation. Simply put, Novell places objects within its Directory Services database within a directory structure similar to what you find in the DOS operating system. With DOS, if you name a file "bob" at the root level of your hard disk, you can still create a directory named "users" and create a file called "bob" within it. This means that two files exist on your hard disk named "bob"-one at the root and one in a directory called "users." They are two different

files containing different information but named the same thing.

Novell Directory Services works in a similar fashion. A network administrator might have two users named "Bob," one located in the production department and one in the main office. Because the directory services are organized in a hierarchical database, both "Bobs" can exist with the same object name. The reason this is possible is the database directory structure.

Microsoft organizes entries within a flatly structured database. All entries are placed at the root. In this scenario two "bobs" cannot exist. This may not seem like a major concern for a small network, but as a network grows, administrators will find themselves frustrated by the fact that they need to use unique names for all objects within the directory structure.

This problem is not limited to network users. It also applies to network resources such as printers, shared output devices and servers. On networks with thousands of users and hundreds of resources, it becomes a major issue. Of course, Microsoft has workarounds, called trusts, but they don't really deal with these issues as effectively as Novell. Novell is addressing Microsoft's presence within the Novell Directory Services by introducing its Directory Services for NT. This is an administrative tool with which NT clients and servers can be integrated into a Novell database. With this approach, Novell hopes to minimize the loss of market share to NT by allowing businesses to use either an NT or a Novell server where it makes sense to use them and Novell Directory Services on a Novell server or multiple Novell servers to manage the whole network (LAN or WAN). The ability to segment the Directory Services database between multiple servers is a plus for Novell.

Microsoft is currently working on a new product that will address these issues, but it won't be ready until 1999. Meanwhile, Novell Directory Services is a mature product now.

In balance. Are any of these things fatal or permanent? Hardly. Our view is that within two years-not long in the context of the expected lifetime of an open prepress system-there will be hardly any difference between network operating systems on these issues. Our crystal ball suggests the following possible outcomes:

* If the Justice Department gets very aggressive, Microsoft will either buy Novell (somewhat at odds with an aggressive Justice Department), make an investment in Novell, back off from competing with Novell Directory Services or put the stamp of approval on it as "complementary" to NT Advanced Services.

* If Justice goes away (such as by the election of a conservative Republican as President in 2000), Microsoft will embark on a new marketing scheme. For example, it might give Advanced Server away free with Internet Explorer (by then charging for its browser) or with SQL Server. Or it might give away the Advanced Server client with each copy of NT client. In this scenario, Novell would shrink to "legacy" network installations.

In either case, systems will migrate forward gracefully and there is nothing to worry about. There are no big system issues. CNI has networks today running both Advanced Server and Netware. They work together seamlessly. (We wrote about this a year ago, suggesting that peripheral applications, e.g., OPI, would run on NT while the core network remained Novell.) Over time, more of the core functions will probably use NT for print and file sharing.

CNI still sees a battle for the management of the network and for fail-over or system backup. CNI currently uses two products for NT fail-over. One of them happens to be the same product we use on Novell networks: Octopus (NT) and Vinca Stand-by Server (Novell and NT).

Note that we also use Novell SFT III-a true fail-over server architecture.

Novell's Wolf Mountain and Microsoft's Wolfpack should offer the same functionality as SFT III, once they are running.

Gateway to the Web. Any desktop computer can dial out to the Internet by using a built-in modem. Most companies, however, don't want this kind of unrestricted access. First, it requires a lot more telephone lines. Second, each PC needs a modem and communications software (not expensive items, but they are more things to maintain on the desktop). Instead, most systems, including prepress systems, are providing Internet access (and all online access) through the LAN or network. It is also the pivotal link for remote computing activity and remote access; it is the remote access puzzle on which a great deal of energy is being spent. We will cover remote access later on in this report.

Security. The network or platform is also responsible for providing security to prevent unauthorized users from getting on the network from within the building or from outside. Network security is built into most network operating systems.

Networks are ranked according to security ratings established by the National Computer Security Association. For example, Netware is a C2-rated network (called the "red book"). What you want is for your entire network to be C2 rated. NT, on the other hand, is certified as a C2 stand-alone device ("orange book"). This means that Netware can be used to build a full network that is C2 certifiable from end to end. NT is not C2 certifiable at all, as soon as you attach a floppy drive, network card, modem, etc. (For more on this security system, see the NCSA at www.ncsa.com.)

Fail-over and the wolves. The current generation of fail-over products are designed to allow a backup server to continue or resume network functions if the primary server fails. An interesting note is that in the five years CNI has been using RAID technology, it has been rare that the primary server has failed. Instead, most primary file server failures are the result of corrupt databases or something other than hardware. So it is important to ensure that a prepress system has a well-understood method of rebuilding a corrupt database, especially in a deadline situation.

Wolf Mountain and Wolfpack have far broader implications in this respect than current schemes. We earlier brought up the possibility of global world domination by Microsoft. But this is not a joke. What we see as Microsoft's objective for Wolfpack is the following: No matter where the end user is and no matter what he is doing, Wolfpack is designed to provide backup for mission-critical (and not so critical) work.

What does this mean? You can have one file server with backup on tape. You can have multiple-CPU servers with fail-over to second (or more) CPUs. You can have RAID arrays with spare hot drives (not part of the RAID array) for swapping drives into the array. You can have multiple servers sharing computing, depending upon the workload on the system.

This sounds like the original objective for the ARPAnet (the original Internet)-to share educational computing when computers were large, expensive and slow. You can use an external mass-storage subsystem, such as EMC makes (a RAID or disk farm), which is separate from the file server. Microsoft's product plans also overlap directly with the distributed computing architecture, for which Java is a key element for non-Microsoft supporters (and for the Web).

With the ultimate implementation of either scheme, Wolfpack or Wolf Mountain, and some complementary products that are either built into the network ("platform") or are options, you can

manage the network and its backup with this technology.

Microsoft has announced that Wolfpack eventually will support clusters of more than two nodes, although to date we have seen only two-node operation. Note that for most prepress applications, where servers typically are paired, this is fine-at least for now.

Neither Wolfpack nor Wolf Mountain (full-scale fail-over) is in mainstream use at this time. Microsoft is currently offering a dual-server fail-over capability that has been improved over last year's beta version in that it now supports automatic switchover. Microsoft's NT Server 5.0 release will include a four-node cluster that will incorporate some scalability and fail-over services. The next challenge will be for software vendors to develop applications to take advantage of this technology. Microsoft's next release of SQL Server (the one after 7.0) will support one database running on several different servers, but it will be some time before we actually see this release. Version 7.0 remains in beta testing with a release target of early this year. It will probably back up the next SQL Server release date to late in the same year. Novell would not comment about its schedule for release of clustering technologies or the capabilities that this project might include.

Other things to watch. In Netware 5.0, Novell will make the network protocol IP (the protocol of the Internet), finally using what Unix and NT have always used. So, after more than ten years, Novell will move away from its proprietary protocol (although Novell will still support IPX, enabling users to run existing networks without updating). NT and Netware both feature extensive Java-based management utilities (for universal local and remote administration). Our impression is that Novell is farther along on this than is NT.

Disk farms. EMC, of Hopkinton, MA, shot up to become one of the fastest-growing high-tech companies with both tape and disk backup systems. In the past three years, its stock has gone through the roof. (One of its founders just funded a new engineering building on Northeastern University's campus.)

Data General, which used to be just behind DEC in the minicomputer business, has survived in part because of its mass-storage subsystems. Both of these companies, as well as IBM, offer huge disk farms that operate in RAID configurations, but as separate subsystems on the network backbone. By distributing the RAID array as a separate subsystem on the network, many servers can access it. It is a fairly economical way of offering huge amounts of storage (terabytes) without having this storage on every server. Its obvious downside is that there is only one. However, by operating in RAID configurations, including live standby drives that take over automatically when a main drive fails, the farm keeps on going until the MIS department can replace the down drive or drives.

Note that this configuration is not normally one we would use in prepress applications, simply because a 20- or 30-GB RAID array is cost justifiable on more than one pair of servers.

Tape backup. We've begun to use a newer technology for offline tape backup systems. Sony has developed a new technology called Advanced Intelligence Tape (AIT). It is much faster than DLT drives and has other advantages:

* It has intelligence on the tape to index the tape. As you write data, it leaves the address on the tape so that it is possible to return to a specific spot.

* It restores much faster-at an effective throughput rate of 130 MB per minute. This becomes very important when you have to restore 20 GB of data after a fatal crash. With older

DAT tape systems, even if you have a 12-GB drive, it can take 6-8 hours to restore one tape. With DLT and now AIT, you can restore even a large RAID array in an hour or so. AIT also has the potential-through writing bits in less physical space-to be able to store 50 GB on a single tape, without compression.

Interfacing the Web; management issues

More often than not, in both prepress and other applications, networks are connected to the Internet. How the network operating system does this is becoming more important. Unix has always been the standard of the Web. We suspect there are still many more Sun servers acting as Web sites than other hardware. However, utility programs for managing a local area network and the Web interface are few.

Novell's Border Manager. Novell has released a product called Border Manager. It runs on a separate server, which can be located either at your site or at the ISP site, where you are connected to the Web. It is the kind of emerging product worth consideration in building a prepress system if (and it is so in most cases) the network also acts as the gateway to the Internet.

Border Manager acts as a proxy server for both incoming and outgoing traffic. It "buffers" often-used Web sites within the Border Manager server. This has the effect of reducing traffic significantly to and from the Web. The net result is that outsiders accessing your Web site get better responses. Inside users also get rapid responses to often-used outside Web sites. Border Manager also acts as a firewall, which reduces the chance of outside online users getting into your own internal computer network.

In the NT camp, Microsoft and many third-party suppliers address this. But our view is that the utility programs are not yet as well developed.

The last part of the Web connectivity has to do with handling Java. We will cover that later on in this report under the remote computing section.

Our recommendation here, again, is to stop worrying about which network platform you use. The three major ones are all robust. If anything, we shy away from Unix. With Microsoft taking dead aim at Unix with NT-and with market momentum building for NT-Unix for us and our customers is probably a walk down an older path.

Network backbones Ethernet

Within a company's building, network transmission speeds of 100 megabits per second are common for workstations used for pagination or ad composition, but not necessarily for writers' stations. Almost all Ethernet cards operate at both 10- and 100-megabit speeds today, so taking advantage of the faster backbones is not difficult. Some older PCs (most '386 and some '486 machines) have bus limitations so they can't effectively operate on the newer, faster backbones. In fact, if you're not careful, you can disrupt the entire network with a bad design incorporating a few slow PCs or Macs. Fast Ethernet switched hubs (which isolate data to each port from other ports, guaranteeing better throughput to that workstation under average conditions) are still more costly than switched 10-megabit hubs. Even today we often see greater cost-effectiveness using switched 10-megabit rates to each workstation than using shared 100-megabit rates (which is cost competitive with switched 10-megabit systems).

The gigabit Ethernet hubs are now starting to come into the price/port range where Fast Ethernet was when it first took off. With JPEG compression for large files, with or without OPI, network performance within the complex is generally fine. With JPEG, decompression takes place

within the RIP, so large files don't routinely work across the network. With OPI, large files also don't move across the network, so, again, network performance is fine.

Gigabit Ethernet is the latest addition to the Ethernet family. The networking industry introduced this technology last year, but products from the major manufacturers are only now starting to be shipped. One of the issues with gigabit Ethernet is that standards are still being defined for the lower-level protocols. It is difficult for MIS departments to feel comfortable in making purchases with the assurance that they are getting all of the features and compatibility that one would expect when installing a network backbone. ASIC design, port density and blocking capabilities are three criteria by which gigabit Ethernet switches can be judged.

An ASIC (application-specific integrated circuit) is a computer chip that contains specific instructions for a special application (in this case, a type of transmission protocol). ASIC design is not standardized; consequently, box content varies considerably from vendor to vendor. The only way to test a switch's circuit integrity is by stressing it with network traffic. Many vendors publish bug lists and fixes on their Web sites for potential buyers to visit before making purchases.

Any port on a switch can get overloaded with data. This is unusual, but it can happen, and when it does, some traffic can be blocked from accessing the port. If a hub allows this to happen, it is said to use a "blocking design." Given that this situation happens infrequently (especially on gigabit Ethernet networks), many manufacturers choose to forgo the expense of designing "nonblocking" switches. However, others claim that this criterion should concern MIS departments.

Another concern for network administrators is over-subscription of ports. The basic ideology is that the proper downlink should be used in any given solution.

If a gigabit downlink to a fast Ethernet switch is mismatched, the manufacturer-advertised bandwidth may not be realized. The solution to avoid letting this happen is merely to do the proper homework when purchasing equipment.

We didn't see much gigabit Ethernet at Comdex. Perhaps it was being readied for the Networld+Interop show a few weeks later.

We also find many sites running T1 lines between sites. We find computing across a T1 line to be "adequate." In other words, you can run realistic, full "fat client" applications (ones written for use within a 10-megabit local area network) across a T1 line and almost not notice that the server isn't physically at your own site.

In fact, often the worst inhouse (LAN) issues have to do with customers purchasing cheap hubs (not "switched"). In other words, all the server bandwidth for multiple users is divided among all users. One of the most cost-effective productivity enhancements we routinely recommend is to upgrade all hubs to a minimum of switched 10-megabit capability. Then, at least, each user gets full, 10-megabit communications to the workstation. (We occasionally still see "thin net," which also provides a shared 10-megabit capability to all workstations. However, don't try to print a large file on a multiuser segment using thin net or shared, 10-megabit 10BaseT. Your other users will wonder why their systems are slowing down to a crawl.)

Client OS: Windows 95, 98, OSR2 or NT?

If anyone doubts that Windows has won the battle of the desktop, note the following headlines from the last year:

* Microsoft invests $150 million in Apple (a round-off error for Microsoft's finances).

* Sun sues Microsoft over Java implementation (really an attempt to stave off the complete global domination by Microsoft over the desktop, the Internet and all software that runs on it).

* The Justice Department sues Microsoft over including Internet Explorer with Windows clients.

* Apple fires its CEO and, in searching for a replacement over the last six months, doesn't appear to be able to find anyone who is both high enough in stature in the industry and interested in taking the job. Mr. Jobs generously has offered his services during the interim period. (Let's see. . . . Could this have anything to do with Apple saving Next by purchasing its OS?) One of Jobs's first moves is to dial the Mac clone builders out of this business, saving the "remaining" Mac hardware revenue for Apple. Jobs announces that the enemy has changed. Rather than Microsoft, it's now Dell Computer. (That's funny. We thought Microsoft made the client OS sold on Dell PCs. How can Microsoft no longer be the enemy if it is part of the enemy?)

Windows issues. Windows 95 currently is the major client OS being used in prepress systems. Windows 98 was first rumored to be just about here. It also was initially rumored to be for the home user. That is, a "lite" version of Windows, not aimed at corporate network users. But the real question is a Windows NT client, for which many CNI customers are waiting-and continuing to use Windows 3.X clients until they can switch to an NT client. We have many more clients using Windows 95 or Windows 95 OSR2-a major upgrade to Win95-now itself a year or so old. Industry publications have widely reported that, because of the high cost of ownership of client-server systems (including upgrades), major corporations have slowed down their client OS migration.

The upshot of all this, it now appears, is that delays in the availability of NT 5.0 have thrust Windows 98 into a role in the corporate market. There is also rumored to be an interim NT client release (called 4.5), to serve at least until 5.0's arrival, now believed scheduled for mid-'98 or later. It certainly is confusing (and expensive) to try to keep up (or to keep upgrading).

Windows 95 is a "mostly 32-bit" client OS. It still has vestiges of DOS. You can also run a DOS window for any old applications you may still be using. What Windows 95 does not have is the full Windows NT client functionality. The Web browser is still an add-on, not built in. So there will be some benefits for eventually winding up with Windows NT clients.

In prepress markets, CNI has been using Windows 95 OSR2, which has a slightly different look and feel from Windows 95. We've been waiting for NT 5.0. Some of our clients are converting to NT 4.0. To be truthful, we find all this client OS business confusing. And, we're certain, so do our clients.

What to do. First, get off Windows 3.1. Newer applications won't run well, since it is 16-bit and most applications are being written now for 32-bit operating systems. Whether you use Windows 95, 95 OSR2, 98 or NT for your client OS, it won't matter. We suggest that Microsoft is confusing the industry with the lateness of NT and the various interim releases. There isn't a whole lot of difference between 95, 95 OSR2 and 98, so stick with any of them until you convert to the NT desktop. As mentioned above, plan on mostly new computers when you do this conversion. CNI has clients who have been trading up two-year-old Pentium machines to be able to run NT client. In fact, the greatest cost of moving between Windows variations is the human cost-training and inconvenience. Windows 95 is fine, even if you want to wait another two years before upgrading to NT.

The major retardant in upgrading to Windows 95 (if you're using Windows 3.1x) or NT is the overall cost of the upgrade. Few existing computers running Windows 3.1 would be really good at running NT client software. In addition, end users will all face major time and cost hindrances in upgrading their application software. Files most likely won't be backward compatible. Although most new versions of programs allow you to save files in an earlier format, normal "quick saves" and standard user processes will ensure that file formats will "drift" into newer formats unsupportable by old software.

We routinely see users spend hours or even days, not counting the actual upgrade time during which the software is installed, learning the new programs and, in general, just learning to navigate through the new software.

Confusion. We view the situation surrounding Windows client upgrades as confusing, perhaps even for Microsoft. We believe it is the NT client that Microsoft wants us all to use. However, the combination of its not being ready (the latest release, 5.0, is now rumored to be coming in mid-'98 at the earliest) and Microsoft's continuing efforts to upgrade other products makes us wonder which client OS Microsoft really expects us to use. For example, Windows 95 OSR2 (a major bug-fix upgrade) features upgraded 32-bit FAT tables, which now support more than a 2-GB drive on a desktop PC. This kind of upgrade, rather than "forcing" us to upgrade to Windows NT clients, suggests that Microsoft expects lots of Windows 95 users.

As for using Windows 98 at home, remember Bob? We can't help wondering if Microsoft will get the home OS right this time. Or will Windows 98 become Bob II?

Our pick. So which Windows client should we use? CNI's view is to pick one and stick with it. It doesn't matter that much which one you take. For new prepress systems to be installed early this year, Office 97 and Windows 95 would be good bets. Or go for the gold and switch to NT client, realizing that you'll be ahead of the curve for a year or so, out there without all the electronic infrastructure available for Windows 3.X or Windows 95. But the advantage will be that once NT client goes mainstream (which is unavoidable) you will already be there. We have clients using both strategies.

Windows CE. Microsoft has a "lite" version of Windows for use in hand-held computers. This OS features smaller versions of office suite applications, a rolodex and the ability to connect to the Internet or dial a home base. The point is to complement a notebook or desktop PC running a full suite of Windows applications. (Does this sound like Java and network computers? A smaller, lighter device to link to certain remote items?)

Where will CE fit in? We cover this in the Java and remote computing section below.

PC hardware

We at CNI used to custom assemble our own PCs from major building blocks supplied by the same companies in some cases that also made complete PCs (Intel, Micron, Seagate, etc). Today, it doesn't make economic sense to do that. From mail-order suppliers (Gateway, Dell, etc.) to aggregators (Merisel, TechData and Ingram), you can purchase a name-brand PC from just about anyone. All that is left is to add the appropriate video card, memory, network card and software. (Even CD drives are becoming standard in low-end PCs-partly because most software today comes on a CD to avoid the use of so many floppies.)

Let's look back over this business in the last year or so: Gateway purchased ALR to try to move into the corporate market, which Gateway's mail-order business was not really doing,

and the server market. So far, the effort hasn't been as successful as Gateway had wished. Why? The explanation goes back to economies of scale, which illustrate the economic forces behind most things that happen. Gateway needed to digest a multibillion-dollar business. The central overhead in both businesses needed to be merged and cut back. If this was going to work, Gateway needed to trim the costs from ALR while keeping ALR's corporate accounts.

Guess what is happening? First, the other giants, which perhaps have done better in the corporate market (note Compaq and HP, to name two), are learning. Already having giant economies of scale in their manufacturing and distribution operations, they are learning how to drive the cost out of distribution, while will using resellers, system integrators and mass aggregators. So while Gateway is trying to digest and shrink its combined operations to get the overhead down, the established competition is gaining market advantage on them.

This is not a business for the faint of heart. You need to put tremendous energy and resources behind the marketing and distribution machine. Only a few strong will survive. Compaq's president suggested that there will be only three or so major PC suppliers within five years-expecting his own outfit to be one of them.

In CNI's Boston market, we have a local PC "assembler" that has supplied custom-configured PCs for almost ten years. Its ads in the Boston Globe got bigger year by year until last year, when they started to become smaller and less frequent. And its radio spots suggest that, in its custom configuration and testing, it is "better than Gateway and Dell."

There was talk that direct-mail PC sales would drive resellers out of the business. We are finding this not to be so. The major distributors and aggregators are offering standard models, while the reseller adds local customization. The major configuration questions for distributors appear to be CPU speed and generation (MMX, Pentium II or Pentium). The standard hard-disk capacity is so great today that it is no longer a variable in a purchasing decision (except for specmanship (mine is bigger than yours).

Our advice. Our advice, which hasn't changed in three years, is:

* Purchase the fastest and newest CPU you can. In two years it will look ordinary.

* Purchase as much memory as you can afford. In two years it will look moderate.

* Don't worry about brand. Most PCs use standard components. You won't upgrade this PC. The chances are that all the components will need upgrading at the same time, so it will be cheaper to purchase a new unit.

* Let the older PCs "trickle down" within the organization.

Databases: SQL and other issues

We've all been under assault for the past year or more regarding which database we should use.

SQL: pros and cons. First, let's look at SQL databases vs. flat-file databases. SQL databases save time in programming for specific applications. For example, when defining relationships among data fields, with SQL, the relationships are defined as part of setting up the database. This is a benefit. But it also is a disadvantage in that this overhead in the database causes the operation to run more slowly.

In non-SQL databases (which still may be ODBC compliant-more later), you have to hard code the relationships among the data fields. This is typically done in a high-level language. This is not hard, and it is easy to support. The key advantages are that it runs much faster and costs

much less.

So, the question is, why all the fuss about SQL? As we discussed last year, it is a standard. So any SQL inquiry-in theory-can run against any SQL database. However, flat-file databases also can be ODBC compliant. That means the data and relationships may easily be exported into other databases. Or you can write an inquiry against an ODBC database from another database.

To CNI, SQL is another checkoff like NT Advanced Server vs. anything else. The industry suggests SQL is what you want, so you need to have it. Having said that, we need to add that, if one is careful, it is possible to implement an SQL database and plan or design around its limitations for prepress applications.

Relational databases in prepress work. A relational database is basically any file management system with an infrastructure in which relationships can be defined among elements in the database. Note that there are relational databases that aren't SQL databases. SQL's original definition (Standard Query Language, defined by IBM) is the kind of query you write against an (original) SQL database. Today, the term is used outside this meaning as well.

The way a user forms query requests is by means of the Standard Query Language or SQL.

You can also have an SQL structure and access technique without its being a relational database. However, for all intents and purposes, SQL implies a relational database in today's usage.

With SQL databases, each time you generate a query, the request must be compiled into actual machine byte code. Many SQL implementations do this using a technique called dynamic SQL. Each time a query is generated, the query must be on-the-fly compiled (or dynamically compiled) into the machine code. Hence, it takes time and the database tends to be slow.

If you have the time to do this, the database works perfectly. Take, for example, a large data-mining operation run by a catalog company, where you don't have a customer on the phone and you have time to generate mail lists or telephone solicitation lists without inconveniencing the end user. You have the time to run quick ad hoc reports (queries) and you reduce the amount of hard code you need to get the results you want.

However, in prepress applications, when a user is frequently waiting for the system to respond and the operation is on deadline, this delay is not a good thing. (We often recall Jonathan Seybold's famous comment: "Users don't want to wait for more than one-half second for any system function when they are sitting there.")

Likewise, if you "hard code" or precompile a standard set of queries, the system would run faster. This, however, is not the nature of prepress systems. It is the nature of, say, a gas company, where a customer calls in and the inquiry is always the same. "What is your telephone number? Okay, Mr. Jones, I see your gas bill payment is one month overdue." In this situation, the query is identical each time and can be precompiled. However, in prepress use, you might get the following two queries: "Show me the list of ads Mary has built since 5 p.m. last night" and "Show me Sam's list." These are different queries, so they must be dynamically compiled to run.

In other words, a relational database is best for operating on queries where you know in advance what you are looking for. In this case, the query compiler can be optimized for the application.

In a prepress workgroup environment, there are a lot of ad hoc inquiries, so you can't precompile the queries. You must do dynamic SQL and suffer through speed problems.

Dealing with limitations. If you are clever in your use of SQL databases, you can come up with a schema that will either optimize the dynamic compiler-which, in fact, is very difficult to do-or you can design your schema around the limitations of the SQL database. As an example, Agile Enterprise's TeamBase does precisely this. Its system at Newsweek supports 430 seats on a single Novell file server. (It replaces an old Atex system, which interestingly used a similar schema, for its time, to get 400 seats to run quickly on DEC PDP-11 hardware!) Five years ago, you could not have configured this size of system on a single file server using an SQL database. The response time would simply have been too slow.

With either SQL or non-SQL databases, you can't preoptimize ad hoc inquiries. So, with either solution, you have to be clever in designing your database schema and you need to use lots of memory and have very fast hardware.

CNI has seen SQL implementations that were designed with a poor schema. For example, we know of one that uses a single table for all database entries. In any database, this is poor architecture. If everything is in one bucket, accessing each record will take longer.

Agile knew that dynamic SQL was not the best design, so it chose the best thing available at the time (remember, this was 1992 or so): an ODBC client, which makes it compatible with any relational database. By adopting this approach, Agile also was able to use stored queries, which can be optimized for each server type.

There is one more important note about SQL and database design. Five years ago, when these architectures and designs started coming to market, there was no proof that this would work with any database. And SQL didn't have any multiserver implementations-another issue for large, workgroup-oriented, prepress applications.

Where does SQL work best? There are a few situations were SQL makes a lot of sense:

* In large, mainframe applications, where "data mining" is done (managing corporate data in many and varied ways, as a "digital" asset). You may need to develop ad hoc database relationships. SQL makes this easier to generate.

* In large, transaction-oriented applications. The best example in the prepress world is classified input, where a lot of smaller transactions take place over a lot of time and you may want to access the data in a variety of ways. For example, in the classified phone room, you may want to get every ad taken by Fred since last Friday and compare that result with the weighted average of all other ad takers who have less than three years with the newspaper.

CNI still sees our future in prepress systems as comprising many databases talking to each other. There still is-including in prepress applications-no single, all-powerful, all-seeing database.

Database-centric views of the world

Recent financial performances of some of the database suppliers have brought into the open some concerns about this segment of the market, including the way some companies have been run and the readiness of the market for these approaches. The following is a quick rundown on the major players and some of the issues at the fore.

Oracle on the NC trail. Oracle's chairman, Larry Ellison, studies Samurai warriors and is fond of saying "only the paranoid survive." It is Oracle and Sun that have the greatest interest in seeing network computers and Java succeed-all, no doubt, running with Oracle databases on Sun servers back at the MIS shop. This would move computing back into the MIS-centric, centrally controlled model. It would also break the Wintel lock on desktop computers. Yes, the

cost of maintaining an NC is lower than the cost of maintaining a full PC. But, in CNI's opinion, the offset in personal productivity using a PC far outweighs the limitations of the old computing model inherent in the NC approach. In addition, the MIS staff will have to be supplemented to support all the remote users.

To CNI, the idea of network computers taking over most computing chores is far-fetched. We have come too far from the days of mainframe-based applications with simple windows into them from dumb CRTs. End users are too empowered, having both their own data and full applications running directly in front of them on very fast computers. They won't go back. They don't suffer system delays, and they have as much horsepower at their fingertips as an entire mainframe system did 20 years ago-while supporting hundreds of users.

Sybase. Sybase, with Informix, is in the next tier of players in this market. It was Sybase with which Microsoft originally teamed to develop SQL Server before Microsoft decided to go it alone.

Sybase is developing Java-based tools for its database products. Deployment of applications is easier with an integrated Java database solution, as the end-user would access applications though a Web browser as a common point of entry. Call centers, problem solving and help desks will be a common usage of Internet databases. These products will be able to reach a broader range of customers more economically. Changing Java components within the database will be easier and open development won't lock you into any particular databases because these tools will comply with industry-wide standards. Applications can be developed with one language using Java, in contrast to using multiple languages previously.

Informix. Informix appears as a second-tier player. Remember, however, that in the mass market, niche players can still be billion-dollar companies.

WebTop alliance. Oracle has friends (IBM, Lotus and Sun Microsystems) helping to fight off Microsoft with Java. The new alliance will develop a set of APIs that will be called the WebTop Specification. It will be developed to work on any desktop and probably will be free. Developers hope to have Microsoft's cooperation in making the API set an industry-wide standard of Java APIs that will make third-party software development easier. Consequently, development costs will be lower industry-wide. Microsoft has shown little interest in this type of standard lately, for obvious reasons.

Microsoft. Is there room left after Microsoft's SQL Server? As with NT at the network OS level, CNI hears SQL Server mentioned in such a way by prospective purchasers as to question why a vendor would go out of its way to push another solution.

Conclusion. Interestingly, CNI has found with its own SQL development that SQL Anywhere (from Sybase) runs a bit faster than SQL Server for those applications we have ported from Novell and the Btrieve database.

Since an SQL database requires that SQL commands be re-compiled after each use, it will always be inherently slower than a flat-file database. For many applications, including prepress ones, flat-file databases work extremely well. These databases are ODBC compliant. So you don't give up anything in compatibility with the rest of the world.

Now, as with C code, SQL database suppliers suggest that hardware speed will catch up with the requirements of the database. So when you really need the SQL database, it will run as fast as non-SQL databases do today. Perhaps they are right. But today, CNI supplies both flat-file

and SQL solutions in prepress systems. We get significantly faster and cheaper performance with the flat-file structure. It saves approximately $500 to $1,000 per seat.

Now that the hardware is finally cost-effective and fast enough, Agile has implemented an SQL version of its TeamBase system. We have done the same with the CNI Ad Tracker database. Both clearly run slower than the ODBC (but non-SQL) versions. And they cost more per seat.

In conclusion, when you are planning prepress system architectures, there is no reason to have SQL. There is also no reason not to use it. It is simply a price-performance choice. There are a lot of MIS types who want to get SQL experience and have it on their resumes. That is actually a good reason to choose SQL for your database. Remember, motivated end users (and their support staff) are a key ingredient in having a successful prepress system installation.

Remote Computing

Perhaps the area in which most energy is being devoted in general computing and in prepress systems is remote computing. In a perfect world (all Comdex vendors seemed to agree that this would be Q1 or Q2 '98), it won't matter where you are, what device you are using, where your data are and what communications speed you are using. You will be able to do any computing job. The only question will be what degree of inconvenience you are willing to put up with, depending on what machine you are using and what communications speed you have available. Less important will be where your data reside.

Of course, there are certain security and access issues that will have to be solved for this to have a ghost of a chance to work. In fact, CNI is very optimistic about these developing technologies. In last year's report, we suggested that bandwidth is simply a matter of time. The Seybold people told us a story about the installation of a T1 line in their office in Media, PA. Apparently, the T1 line was going to be run on a wire pair from an existing bundle (cable), which had been run into their offices years ago. In other words, the T1 wiring was going to work over existing copper wires. If this is true (note that the phone company central switch handles a T1 line very differently from voice traffic), then pricing of T1 service-at least from the phone company office to your building-is simply a matter of marketing, not technology. If the phone people can run a T1 line into your office over existing copper wires, then perhaps we are even closer to much faster and cheaper bandwidth from the local telephone company than we thought.

Almost every business (and certainly prepress) is already using desktop computers. Perhaps 30% of daily newspapers are already paginating. So there is no real mystery here. Remote computing is the last major puzzle to be solved before we are able truly to make the "do anything from anywhere" come true. This ultimate extension of the original distributed-processing technology will provide personal and business productivity that we are only now starting to understand.

The Boston Globe summarizes placement of venture capital in each region in the U.S. every few months. It also summarizes the applications in which the money is placed. In the last year, communications software, Internet access software and security-access software received the largest amount of venture capital.

Infrastructure: a new battleground

The battle to purchase MCI was won by WorldCom over British Telecom. MCI is a much larger company, and it is better established than WorldCom. Why did MCI's shareholders turn down a stronger cash offer from a better-known potential suitor than WorldCom1? Why did MCI

sell at all? And how did this David slay Goliath? Obviously WorldCom's management had a lot do to with it. MCI's statements say just that. WorldCom's vision impressed them. What vision?

In the old model of communications, you laid electronic pipe, bandwidth. Then you set up an infrastructure based upon large fixed assets and priced it accordingly-a higher price to the consumer for longer-distance calls. The new model is to purchase your circuits and use fiber and satellites wherever and however you can. In the long run, the company with the greatest amount of packet-switched circuits will win the battle to supply us our computer and voice bandwidth against companies that own dedicated circuits. In WorldCom's case, the kind of bandwidth it has acquired over time, combined with its vision, has the better plan, at least according to MCI's board of directors.

The old model is tied down with the central switched voice traffic systems, which, although they are part of the raw communications bandwidth, are not set up for the kind of digital computer communications we all want.

WorldCom is in an excellent position to invert the pricing model for high-speed digital communication service. It isn't tied heavily to fixed, non-packed switched services. Instead, it can price its packed switched services aggressively to attack this rapidly expanding business. It appears to us that WorldCom's largest advantage is that it isn't burdened with 100 years of lethargy. (We often see that in new technologies. Look at what happened to traditional prepress vendors with the arrival of the "fourth wave.")

Why would MCI sell? Its founder is gone. Current management was running, in effect, a somewhat more modern version of an older-model telephone company. Only the combination of the vision of WorldCom combined with MCI's market position (its number of clients and circuits) would maximize shareholder value. It appeared to have lost its vision of the future.

This is not a good portent of things to come for the other existing traditional telephone companies. (Note Nynex's merger with Bell Atlantic.) It appears that these companies do recognize their own inertia and are moving to be better positioned in the forthcoming years.

The new infrastructure. What is this infrastructure going to look like? For prepress systems, and all others, remote users will want to access central files and other users through the Internet, direct dial-up and other dedicated lines. Last year we covered some of the alternatives (T1, T3, frame relay, ISDN and ATM). The two links that offer the greatest potential are higher-speed dial-up service and remote access through the Internet (Virtual Private Networks). Note that the Internet also raises the question of what programming and technological model will win here (mainly, Java vs. everything else).

AT&T is offering a service called WorldNet, which is an alternative to Virtual Private Networks but which acts exactly like a Virtual Private Network. The difference is that it runs over AT&T's private lines and uses AT&T frame relay for switching.

Modems and remote access

Let's start with modems and remote-access programs. First, a note to our fellow suppliers in the modem hardware business. We need a standard for 56-kbps modems. It's the fastest thing we've had and may have for a while, so it is ridiculous that we don't have a standard. This is one where we, the resellers and end users, should insist back through the manufacturers that we get together. The lack of a standard is costing modem sales. (In a late announcement, the international organization of modem suppliers agreed in mid-December to such a standard. The date for

delivery of products is unclear. Also unclear is what happens to people who purchased noncomplying 56-kbps modems to date.

Diamond has a new technology that enables users to combine two different modem calls into one, thus providing an effective 112 kbps of bandwidth via "shotgun binding." This is software that works with a standard modem. Diamond presents it as a way of attaining faster Internet access to end users now, without having to wait for digital infrastructures. Diamond sells this product in two flavors: a one-modem solution that can be added to an existing modem that the user might already own, or a cost-effective, two-modems-in-one approach. Diamond is currently working on a point-to-point solution that would support remote access.

Cable networks and cable modems

The cable modem arrived in the past year. In New England, most companies offer this service to homes and businesses. However, you have to be careful. On a particular segment, you can often see all the other systems, so you need a router to isolate your machine from everyone else's. But the speed is about 500,000 bps upstream. Bay Networks and 3Com offer modems from 320,000 bps to 10 million bps upstream, 27 million to 36 million bps downstream (video speed). These units should cost $200 in 1998.

Downside. The downside of cable modems includes these items:

* The cable companies really didn't set out to become the information pipeline provider in the community. Their cables were built for one-way communications. The companies have a lot of work to do to support many high-speed data connections to individual businesses. Availability is still spotty.

* Communications are not yet secure. As a result, you may not want your valuable corporate data moving through the local cable company just yet.

With cable modems, the remote user is just another client on the corporate network. There is no special remote access technology to support this type of access. Response time for typical functions will be somewhat slower than on the LAN within the building, but the average remote user will not notice a significant difference. Cable modems are really another form of a Virtual Private Network, using the cable company as the pipeline between the user and the Internet access point.

Technical issues. The cable modem standard was published in initial draft form about a year ago and finalized last fall. Broadcom is the largest vendor and meets the functionality set by the MCNS (the committee that defines standards for cable modems). Motorola should bring MCNS technology into the marketplace in mid-'98. Companies like Time Warner, Comcast and Media-One are currently using this technology.

Service providers must upgrade their plants with HFC (hybrid fiber cable) technology. This keeps noise figures low on the transport link going out to what used to be a long amplifier cascade from the head end to the subscriber home, but is now a fiber node that serves between 500 and 2,000 homes. With that upgrade also comes a return path that uses the same technology, with the emphasis on having as little noise in the return path as possible. This is the hard part because the 5- to 42-MHz return paths are where motor and ignition noise from cars and sometimes fluorescent lights and hair dryers kicks noise into this bandwidth.

Building quality plants that will support value-added products like cable telephony and cable modems has been the challenge worldwide. Broadcom currently has installed the largest

worldwide customer base of cable modems. We expect ISPs will include cable modem costs within their service rates.

Digital Subscriber Lines. Last year telephone companies and standard organizations were expecting Digital Subscriber Lines to become widely available in mid-'97. At this point, DSL deployment is sparse, as changing standards and evolving technologies continue to hamper efforts to bring these products forward.

As these standards continue to evolve, equipment manufacturers must make adjustments to production, driving up costs and creating additional decisions in implementation strategies for telcos. The strength of this technology is that 128 kbps and higher speeds can be implemented over existing copper wire. Asymmetric DSL services will offer up to 7 million bps downstream and approximately 1 million bps upstream as the technology matures.

ADSL and RADSL (asymmetric and rate-adaptive DSL) are currently farther along than competing digital services. US West, a telco with a 14-state territory, plans to deploy its MegaBit services to its customers in the coming months, which will support data rates of between 192,000 bps and 704,000 bps. The minimum service cost will be $40 per month. Bell Canada began services in October, offering its customers in Ottawa and Quebec City 2.2 million bps downstream and 1 million bps upstream via ADSL.

Other modem developments. Motherboard manufacturers are integrating more components onto their motherboards-products like sound cards, mice and video. This lowers costs to the end user. Motorola is trying to corner the modem market with this model. The initial push is to package software with a peripheral interface board. This plug-in is a low-cost, low-risk way for motherboard manufacturers to move to this standard. In doing this, software modem manufacturers will build credibility with their customer base and support backward integration.

The next stage will enable motherboard and multimedia subsystem integration. Some system manufacturers are evaluating the Motorola approach and may go to production on systems that will feature these modem interfaces built onto the motherboard. Within the next year, expect to see board-level products and some multimedia communications products. In two to three years, expect many more motherboard implementations.

Cost savings should reach 20% to 30% of conventional internal modem prices, with additional savings as motherboard integration becomes tighter. Another benefit will be simpler system upgrades. Imagine upgrading modem speeds by loading a new software program.

Remote access technologies

For dial-up remote access, there are two different approaches for remote computing. Which makes the most sense depends upon the needs of the user and of the business. For publishing companies, both make sense in specific areas.

Remote Control. With the first one, called Remote Control, a user somewhere takes over a CPU (normally a simple PC) at the file server site. The Remote Control facility sends the remote user the screen displays and the keystrokes. (We've heard these programs described as "screen scrapers!") In this model, which uses products like PCAnywhere or Carbon Copy, the application program runs on the PC at the file server site. This reduces dramatically the amount of information that is sent through the telephone lines. Remote Control is almost always used with dial-up phone lines (and standard modems).

As an example, Novell supports this kind of dial-in with its Netware Connect product. Like

Remote Control programs for other platforms, such as NT, this approach uses the standard directory services of the network. Thus, security and access to the network from a remote site are tied into your user ID on the network, even if you dial in from a remote site.

Novell has also provided this service as part of its Border Manager product (covered elsewhere in this report). However, by putting Netware Connect on a Border Manager server, you take care of security and control of access in an idenclients on the inhouse network. The main advantage here is that it simplifies the management of remote network users on a system.

There are lots of third-party products here. Citrix has a product, called Winframe, that bundles a modem pool on a single remote-access server (a PC) at the central site. This is a simpler system to support than a batch of individual PCs, each running remote-access software.

Remote Node. The other remote computing approach, called Remote Node, makes the remote user a full-function client on the network. The implication is that bandwidth between the file server at the corporate site and the remote user is high enough to support the user with reasonable performance.

The major advantage of Remote Node access is that it uses only one piece of software for both remote and local users within the company. There is an implication that you need to have good control of the remote machines to do this. (Nothing frustrates end users more than getting out of sync with the LAN so they can't do their work.) Again, the important implication here is that there must be some way to manage these remote PCs. With Remote Node, all applications are the same-inhouse or at a remote site. Management tools are needed to ensure that remote machines work well.

Related issues. What are the related remote computing issues?

Very high on this list is handling directory services across an extended community. When you have lots of remote users, you need a way to control who they are, what their access rights are and security (for getting on the network at all). These things are well understood within a local network today. The implication is that the best way to extend the network to remote users is to employ the same structure and procedures to do this as within the LAN. This suggests that Novell and Microsoft are sitting on a potential major expansion of their businesses.

You also need a way to route traffic from outside users to your inhouse network. Many remote users are supported by software-based routers that run in the network operating system. (Novell handles this function in Border Manager.) But you can also use standard products such as those offered by Cisco. Remember, each time you add this kind of function to your network, someone must manage it. There is an obvious advantage to using as many pieces from the same manufacturer as you can. This will simplify management.

If you can use your network OS to do this, you greatly simplify managing remote access. For Intranetware, for example, you can use Netware Directory Services for both authentication and identification. In the past, the dial-up products had their own dial-in authentication. This is yet another program to learn and manage.

Other issues for remote users. We cover Java later in this report. However, in this remote section, we will spend a little time on Java in the perspective of other remote computing approaches.

Every server supplier and network OS company has announced full support for Java running on the file server. This is very important, since many Java applets require server-based

Java just to boot the program. So if Java is an important model for remote computing, then, as an owner of a prepress network that supports remote users, you need to understand and ensure that Java is well supported on your network.

It is also going to be very important to have good manageability of Java on your server, since you will be supporting a large group of remote unsophisticated users.

There is also a certain irony at work in Java for remote computing. In order for Java and network computers to work, you need lots of Wintel (and Unix) machines behind the scenes. The more successful Java and this remote architecture is, the more heavyweight servers (and NT Advanced Server, Netware and Unix) also will be sold.

One last point. As remote computing models develop, you have at present two main models of computing: one with the full application on the desktop and the other following the traditional mainframe model, with the application running centrally and a dumb terminal seeing it from the user's seat.

Middleware. As remote computing takes off, there will be many levels between these two extremes. So we should look for a new layer of software-middleware-to bridge these two worlds. Middleware will resemble what we today call "groupware" in prepress systems, and what IBM has in Lotus Notes (Domino) and Novell has in Groupwise. However, the middleware required for this extended remote computing model will have functionality not present in today's groupware. We'll say more about this under prepress topics in Part II.

Other remote computing issues

Microsoft has purchased Web TV. This technology delivers a one-megabit data rate to the home with a video modem and it turns a TV, using Web TV's settop box, into a general entertainment and Internet machine. So, for example (thinking like a Microsoft marketing person), say you are watching TV and see something that interests you. You pick up your expanded clicker and switch to a Web site to buy something. This is a nice model. It makes seamless the distinction between one-way television and interactive, Web-based E-commerce.

For prepress applications, this would allow, say, an advertiser or a reader to access a newspaper's material, which could be sold via the Web. So a reader of the newspaper could pick up his settop clicker and dial the newspaper's Web site to order a reprinted color photograph of the newspaper's coverage of the local golf tournament, featuring that reader in the photo. Or the reader could order a copy of the article ("suitable for framing") that covers Junior's success in the peewee football league.

We suggest this is one possible model for a publishing business built around what is printed in the newspaper and what is offered online.

Virtual Private Networks: new paradigm

Virtual Private Networks (VPN) are based upon software that allows remote users to connect through the Internet. The software takes care of converting standard network protocols between remote sites. The obvious advantage is that you only need local telephone access to connect to your home site.

The obvious disadvantage is that you are at the mercy of the Internet for your response time. So, don't do remote classified input using a VPN. However, do use it for booking an ROP display ad on a notebook computer and calling it into the central office.

As an example of what one company is doing here, Novell will be delivering a VPN client

for "remote roving" users.

There are other high-speed access techniques. Like VPN, a high-speed access line such as T1 service relegates the remote user to being just another client on the network. T1 service could be priced much more competitively than it is now. In fact, we argue, over the long run, much higher-speed telephone (digital) communications will render much of the remote-client issue moot. In the meantime, T1 service to each household or an on-the-road remote user or a remote office is not here.

So what are people using?

Frame relay

Frame-relay technology appears to be one answer. Phone companies have finally been installing the ATM switches in their central offices to handle Frame "cloud" switching. (A "cloud" is a network whose topology is complex.) This means you can finally get the incremental bandwidth at a cost-effective rate. Frame relay is a switching technology (in the central office). It is starting to take the place of fractional-T1 lines. With frame relay, the phone company or your ISP can share the central office bandwidth, in contrast to dedicated T1 circuits.

The net result is that you can afford more bandwidth at better rates. The downside of frame relay is that you can't be guaranteed the exact bandwidth you want at any moment. (The provider can guarantee you the bandwidth from your site to the central office, but you may have to wait for the Frame cloud to give you the connecting bandwidth to the other site.) This is precisely the same issue with the Internet. However, with frame relay, at least you are operating on a nonpublic line between individual telephone company offices. You can get this "bandwidth when you need it" in most areas today. It provides a minimum of 56 kbps or 64 kbps and a maximum of 500 kbps. Its major advantage over T1 use is cost.

Clouds. The frame-relay standard is an extension of ISDN standards. This technology offers throughput that ranges from 56 to 768 kbps. However, frame-relay networks can support speeds of 1.544 mbps over T1 lines and 45 mbps over T3 lines. This service is supplied over fiber-optic and digital circuits. It is not a dedicated, point-to-point service like T1 and fractional T1. Instead, it is provided through a frame-relay cloud.

A cloud allows businesses to connect multiple locations without supplying separate point-to-point connections for each site. Another benefit of frame-relay technology is that, when needed, it will allow data "bursts" up to twice the subscribed bandwidth. The frame-relay standard defines the infrastructure of the connection between the user and the WAN, but it doesn't address the WAN and its infrastructure itself.

Appropriate applications. Frame-relay connections are virtual circuits. Frames are defined as encapsulated units that travel in high-speed bursts across a digital connection. There is no error correction in frame relay. The packet disassembly and assembly are managed by hardware on either end of the connection. Because it is not a constant stream of packets, the technology is not really suited for voice or video transmissions, but is best where data can tolerate some delay in packet reception. E-mail and Internet access are better suited for frame-relay use because it can lower costs substantially.

ATM, X.25, TCP/IP and cell relay also use fast packet switching to carry out transmissions. A frame can carry packets from different protocols, such as Ethernet and X.25. In fact, many vendors have marketed frame relay as a high-speed, simplified version of X.25.

Network computers and managed PCs

Network computers have two potential major uses. One is to run Java applets from a server. This is the Oracle-Sun dream of recentralizing data processing to the MIS department (and breaking up Microsoft's stranglehold on the computer industry). This requires only a CPU, memory and communications to the central file server site.

The other major use, as CNI sees it, is to run standard Windows applications. Network computers are being shown with peripheral devices (floppies, CD-ROMs or even hard disks). These machines are called "managed PCs." Note the implication that these machines are not configurable by the end user. Thus, they are easier and less costly to own and maintain.

We see the "lighter" versions of PCs as very useful for certain applications. However, if you look at what most people do "on the road," you notice that they use a notebook computer, with optional communications. The notebook is used as a stand-alone remote office. The communications capability takes care of establishing a link to the central office and its central database.

One does everything. There are lighter applications where you can work without the full notebook. For example, accessing your rolodex and simple note taking. (Remember the Newton?) And E-mail. But when we look at what any high-end remote user does, we suggest that a full notebook, with full Windows clients, is what people will need. The increasing speed and decreasing communications costs are going to make one machine-a small, lightweight notebook with full functionality-able to do almost everything. Perhaps we'll have a continuum of devices for our full daily lives. From palmtop and Windows CE devices to notebook and desktop machines.

Microsoft has released a server-based operating system, called Hydra (based upon technology from Citrix's Winframe products). It is aimed at providing server support for its lighter, thinner Windows CE devices.

Windows CE is simply a lighter version of Windows. Since it is not full-function and is designed to run on palmtop devices, it needs a server from which its applications are managed.

Cost of PC ownership falls

The non-Wintel crowd is talking about the network computer and Java being cost justified because of the high cost of ownership of PCs. We agree that maintaining a large network of PCs and Macs with many nonsystem-oriented end users can be difficult. However, PC administration is much simpler today than it was under Window 3.X. Also, many suppliers are now stressing the simplified management tools that come with the hardware (and with the client OS).

Note that Microsoft understands the full "cost of ownership" issue that is raging in client-server applications. Microsoft has the NT 5.0 Zero Administration Windows initiative. In fact, Windows 95 and 98 have significantly simpler administrative management. And note that the major PC manufacturers each have their own low cost of ownership initiatives. Most have built-in technology for this. Note also that this will not appear until NT 5.0, which is expected sometime in 1998.

Compaq's Insight Manager. As one example, Compaq has a product called Insight Manager that offers an intuitive interface with tools designed to reduce management time and cost, troubleshoot faulty components and make inventory tracking simpler. Its remote administration utility allows a system administrator to track, troubleshoot and formulate corrective measures for

faulty components in Compaq servers and desktop computers.

For example, through a network connection, a dead or failing hard disk can be diagnosed and scheduled for replacement remotely from a system manager's workstation. No guesswork is involved in determining the status of hardware.

In addition, Insight Manager shows all information pertinent to every piece of Compaq hardware in a Compaq system, including part numbers, serial numbers and replacement part numbers. This information can be used to inventory all computer hardware for accounting purposes.

Intel has developed its Wired for Management Initiative to bring down the cost of ownership.

In perspective. In CNI's view, the full-function PC, which puts most of the data directly on the user's own desk, will not go away-particularly if you look at what Intel, Microsoft and all the PC suppliers have to defend: a $200-billion-a-year business. We suspect these management tools will get to the point where managing even a far-flung network will be well within the capabilities of "mere mortals" to support.

In our view, this will not be sufficient for network computers or managed PCs to win the desktop computing and remote computing battle.

Contributing to this view is our expectation that portable devices will continue to improve. IBM's notebook division chief confirmed this in a recent interview in Infoworld. As one of the premier suppliers of hot notebook computers (its ThinkPads are still the notebook to own), IBM foresees smaller, inch-high, faster, better-screened notebooks, coming as soon as this year.

Other cost-of-ownership issues. CNI has a lot of experience with PCs being delivered loaded with all kinds of "free" applications and with custom versions of the client OS (particularly Windows 95). We have had many instances where we have had to remove all of these applications-or move to a more standard version of Windows 95-just to get the PC to boot on a network. Although Windows 95 and newer client operating systems do a much better job of configuring and setting up all the peripherals and software (making it plug and play), the result may not run very well. We suggest testing each new application carefully before general deployment throughout the network.

NT Server. NT Server 5.0 will incorporate what Microsoft calls the Active Directory. The Active Directory stores information about all of the objects on the network and makes this information available to administrators, developers and users. Active Directory includes a user interface for accomplishing most administrative tasks, such as adding new users and managing printers. Apparently Microsoft has decided that Novell had it right all along.

Server 5 also includes enhanced storage-management tools. The most notable is that administrators can now perform online tasks without needing to shut down the system or interrupt users. Server 5.0 includes the new NT Media Services service, which provides a common interface for mounting and dismounting and managing various forms of removable media devices such as tape drives and optical storage devices. Finally, Server 5.0 includes improvements to the NTFS file system, supporting file encryption and per-user disk quotas to improve management of the storage capacity.

The Distributed File System, which will be part of NT Server 5.0, allows users (or administrators) to create a single directory that contains folders and files spanning multiple servers

within a group, division or enterprise. These directories, which can be assigned logical, descriptive names, make it easier for the user to "browse" the network and access the information needed quickly.

In the Microsoft Management Console we see Bill Gates's incarnation of an old idea. The MMC provides system administrators with a common interface for viewing and managing network functions and using administrative tools. The MMC is fully customizable, supporting add-on programs called snap-ins a la Novell's NWadmin.

Server 5 will also implement a new Win32 driver model that is a unified driver for both NT 5 and Windows 98. It will enable new devices to use the same drivers for both operating systems. NT 5.0 will reportedly continue to support previous NT drivers. Windows NT 5.0 will also finally support plug and play, making it easier to install and configure hardware devices.

Distributed applications. This category includes a wide array of development tools and standards developed for NT 5, which make it easier for software developers to create networked applications that take full advantage of the network resources.

More important to the average system administrator, however, is the automatic application installation, which allows an administrator to specify a set of applications that will always be available to a particular user or group. If a required application is not available when needed, it will be automatically installed on the workstation. A number of features are provided with this service, including the ability to repair applications or reinstall specific components on an as-needed basis.

While this automatic application installation would reduce the administrative workload, there remains a question as to how much additional network support (specifically storage and bandwidth) must be allocated to this process in order to carry out these installation tasks in a timely manner.

Java: the issues and battleground

Let's look at the basics. Java is a programming language, invented by Sun for potential use in managing all kinds of nontraditional computer devices (toasters, ovens, etc.). This application did not materialize right away. (Is your toaster controlled by your household computer? Ours isn't.) As an aside, both Apple and Microsoft announced similar initiatives several years ago. All three companies, it appeared, were looking to be the general device operating system for the day when everything we own communicates with everything else. (Your home computer will control all the devices within the house. So you will be able to yell at your home computer rather than your spouse if your pot roast is overdone some evening.)

The idea sat around for a year or so until Sun figured out that it might be a weapon to use against Microsoft and the Wintel monopoly, especially on the Web. Java, like C, was developed with a modular and portable objective in mind. If Java has any major strengths, it is that you can write a program once and run it on any hardware that has a Java Virtual Machine (basically, software that interprets the Java code). Sun, Intel and Apple have JVM applications. Windows NT Advanced Server and Novell Intranetware also have JVM support on their file servers.

Java, like the C language, is a structured programming language as well as an object-oriented one. The structured part allows programmers to work in more formal channels, which allows other programmers to pick up and work on a piece of code more easily. In addition, it allows interfaces between programming modules to be written more easily.

The speed issue. A disadvantage of C or any higher-level language is that it consumes more computer resources than a more efficient assembly-language program. Programs written in either language tend to be large. However, hardware speed and reduced memory prices-at least so far-have provided platforms that have allowed these programs to run quickly enough. (There are exceptions. Word, until Office 97, simply didn't run very fast even on a fast Mac, compared with its speed on a PC.)

It is our view that the hardware has not yet caught up with Java applications. As if Sun were trying to prove as much, this fall the Illinois company that makes the software that rates the performance of various Java Virtual Machines claimed that Sun had cheated on its own Java implementation. The claim stated that modifications Sun had made for testing purposes would, in fact, slow Java down even more when used under normal circumstances. Since this story broke in November, normal politically correct denials and fast footwork by Sun have seen the story die down. However, the story was most revealing about the amount of money at stake here to try to derail Microsoft and capture the "remote computing" market.

Object orientation. The first question to address is this: If object-oriented programming is what we as end users need, has it become the standard in our industry? The answer, we'd say, is that it has, in part. If there is an economic incentive to use these tools, developers will do so. The use of more modular code in our industry suggests that it is working, after a fashion. However, we have noticed that in many high-end, large applications, where speed really matters (e.g., editorial groupware, which links Word and Xpress into a "system").

Often groupware source code is hard coded. It would appear that the end use of the technology is here, but the underlying structure is not always used.

The basis for Java is "write once, run anywhere." Which machines? If you look at the installed base, and at the kinds of machines that are being sold, there are really only three that matter. The first and largest is Intel based. The second and third are the Macintosh and Sun workstations. One can't help wondering if there is really a large market for full Java applications. You have the large installed base of Windows machines and its growing advantage. Windows-based applications work fine. Microsoft has invested in Apple-also guaranteeing to keep making application software for the Mac. Microsoft also has its own agenda for the Web and online commerce. It certainly makes one wonder.

We should differentiate Java applets from full applications. Applets are small tasks, often running within a Web browser, which works just fine, such as in selecting a theater ticket from your home computer. Full applications, such as trying to rewrite the Corel Office Suite under Java, so far haven't been very successful.

We spoke with Craig Cervo,3 VP of product development at Applix, one of the few companies that have successfully shipped a Java-based office suite of programs (word processor, spreadsheet, etc.). Unlike Corel, which abandoned its Java effort (some $7 million later), Applix's product, based on a Unix server, actually works.

Microsoft's role. Java is object oriented. Remote computing requires dealing with objects that may be anywhere. Hence, you want an environment that uses distributed objects, providing an efficient way to write code. Microsoft has been working on this technology for years. First, there was OLE (object linking and embedding), which didn't quite do it. Microsoft expanded it to COM (component object model). That also wasn't quite "it." So now we have DCOM

(Distributed Component Object Model). This appears to be close to the target. All three are part of Microsoft's ActiveX technology. (Do we have enough acronyms yet? Wait! There are more!)

Microsoft has renamed ActiveX the Distributed Network Architecture. (DNA. We love it-the building blocks of our future computers!) DNA is part of NT 5.0, which isn't shippable yet (and which some folks are saying will actually become NT 2000, named for the time it is shipped).

Microsoft has been at this long enough that its technology is actually quite solid-and quite well developed.

CORBA. As opposed to DNA, we have something called CORBA (Common Object Request Broker Architecture). CORBA was developed by a somewhat amorphous consortium that has been around since the late '80s. It is a very mature technology and a development environment, being developed against a standard set by organizations we don't know. (Like the book The Chamber-powerful judicial forces setting our standards, with brutal enforcement if you step out of line.) In contrast with the mystery surrounding the forces that set its standards, you can buy a CORBA development environment from companies like Visigenics. CORBA is used by large financial institutions that already have large enterprise networks-with lots of distributed objects (our money!).

Now along comes the Java language, which initially didn't have support for remote objects. So both the CORBA folks and Microsoft (COM/DCOM) were not wholeheartedly in support of it. Microsoft had another reason for not endorsing it-it had its own language, Visual Basic. And Java, with Netscape and Sun cheering all the way, had its own approach for distributed computing.

Sun and Netscape have announced very large galactic-scale networks using the CORBA standard. CORBA also uses a special, higher-level object protocol called IIOP, which sits above CORBA and is used remotely to access objects on remote machines. Sun has announced it will layer IIOP on top of Java for these large-scale projects. So, again, Sun and Microsoft are at odds in their approaches to distributed computing.

Java and DCOM are not mutually exclusive. Sun and Microsoft are trying to make Java and DCOM work. Sun sued Microsoft because Microsoft has incorporated Windows features into Java. Microsoft would also have you use Visual Basic, as well as Java, as the development language. Most important, developers tell us that Microsoft's Java environment is perhaps better than Sun's. So no wonder Sun sued Microsoft. Not only is Microsoft trying to subsume Java, it is appearing to be winning the battle.

Server issues. The last bastion then would be servers. Novell has announced that Java will run better on its servers than on anyone else's. Sun is certainly well established in the server business. There are probably more Sun servers on the Web than any other (although NT and cheap PCs are coming on strong).

One argument for NCs, Java and remote computing is that this is the only way to control the cost of ownership of PC networks. For this to work, things must radiate out from the file server. This would provide Sun (and Novell, NT and the SQL database guys) with a reason to live well and prosper. With CORBA and DCOM, you can use dumb machines as clients.

Microsoft is also addressing the cost of ownership with the NT 5.0 client, with its Zero Administration initiative. But this won't happen-again-until 5.0.

Until now, remote computing initiatives using standard Windows and PCs have not worked quickly enough for the mass market. This is because you typically have layer after layer of DLLs that are very slow. This doesn't work well. This is where Java and CORBA and DNA would work well.

XML. The last part of remote computing infrastructure concerns the new XML initiative. This extension to HTML by the World Wide Web consortium will allow Java and Microsoft's standards to exchange data. XML defines a standard that any approach to remote computing will understand. This will allow documents to contain both word-processing-quality formatting and layout and distributed access (URLs, which HTML supports today). Within 8-10 years, this might happen, making the Windows-Java issue go away. However, CNI fully expects this remote computing war to be resolved long before then.

Microsoft claims to be fully behind XML (unlike display PostScript, which Adobe had originally tried to sell to both Microsoft and Apple as their screen imaging model). With Microsoft agreeing to support XML, we can hopefully look forward to future versions of Word and maybe even Xpress supporting this standard- at least on output or from the Web into Word. What this will mean is, at last, a relatively efficient way of inputting and formatting information both for online and print use. You could write a text story for online use and then repurpose it back to the "for-print" publishing system. Note that XML would aim at the viewing program (today that is the Web browser-i.e., Microsoft Internet Explorer) doing the composition. That's not the model for print publishing. So this technology, at least for now, would

not be "write once, publish anywhere" without some human intervention in the workflow.

In order for all this to happen, middleware developers (the companies currently building prepress system software in our industry) will have to retool their APIs (the interfaces between programs) to use the XML standard. That's because programs like Word, Xpress and others used in prepress systems need to talk to databases to control and manage workflow. If the internal formats of these programs change, then the links and how these programs talk to the database will also change.

Ending the search

With this background, what are the questions and answers we should be seeking in our remote computing search, both for prepress and general applications?

A Windows universe. First, if you don't use Windows you're at odds with the computing universe as we know it. This is very important as you plan your remote computing architecture. As a result, we, as an integrator, and you, as a customer, are depending upon Microsoft first and foremost for making these technologies work in an integrated fashion with Windows or with whatever Microsoft deems ready to take the place of Windows. (It could be Internet Explorer seamlessly integrated as the front end of applications like Word, but it would appear that recent Justice Department litigation is at odds with this approach.)

People are discovering that Windows is expensive. (See the discussion of the cost of ownership elsewhere in this article.) There are places where remote computing with "thin" clients makes sense.

So if people are using software across networks, there is some reason to consider the DCOM or CORBA distributed-object approach.

Application focus. But how do you reconcile this with Windows on PCs? CNI suggests you

look at the applications. Most prepress users work most of the time on large files, one at a time. This is not a distributed architecture, even if you are at a remote site. If you're writing a story, it is you and your single computer. If you need to retrieve something from the newspaper's central site, this is a one-time function. This kind of access needs to be controlled, and CORBA and DCOM are logical architectures to do this, even if your computing device is a full-function PC or notebook.

However, if you are a display ad sales rep at a client site and want to enter the client's order for an ROP ad in your newspaper, the DCOM and CORBA approach, based on a "thin" client, makes absolute sense.

The thin client reduces the cost and complexity for that salesperson in accessing the newspaper's database to enter that order.

Now, what kind of device is this going to run on? Elsewhere in this article we cover the continuum developing in hardware devices. If you work on stuff for a long time-whether in your office or on the road-you're going to have a Windows notebook computer. This Windows machine will also run the remote computing architecture, whether it is CORBA or DCOM. So there is no issue here. Run your full suite of Windows applications when you need them. Then use your Web browser to access Java applets for those things you need them for.

If you're a working person who does only small "thin" client kinds of things-checking E-mail messages, checking whether your administrative assistant has boofor you while you are on the road, logging a pickup or delivery if you are a Federal Express delivery person, etc.-then a network computer or palmtop machine probably makes sense.

However, this strategy does not leave room for Sun and Oracle to "win" the remote computing battle. As we see it, there simply aren't enough "thin" applications to have this architecture win out over Windows.

And remember, the reason for Sun and Oracle to push network computing is to win out over Microsoft. Well, Macs don't yet run Java particularly well. And certainly Sun is not going to convince anyone that its workstations are the answer against buying Windows PCs. (Remember, if Java really wins against Windows, why would you buy a Sun workstation anyway? NCs or Windows PCs or other desktop computers are cheaper than Sun stations.

The last item is what one friend calls the roadside test. Go into CompUSA and see how many Java software applets or titles are for sale. Not many. In many cases none. The Java applets you do see tend to be freeware obtained from the Internet.

Write once, debug everywhere. Wags modify Java's Write Once, Run Everywhere message to say "Write Once, Debug Everywhere." Our impression is that unless and until the "standard" Java language issues get ironed out, this joke will remain more true than not.

Let's look at one example of Java reality. Infoworld ran tests using three different Java implementations to test a simple Java program:

* One Java virtual machine implementation broke Java rules but ran on all platforms.

* One used Microsoft's Java additions and ran only with Explorer on NT, not with any other browser.

* One used 100% pure Java and ran on all platforms but had a different look, feel and operation on each machine.

Java's other major issue is speed. Java is an interpreted language. Its execution speed can

never match compiled programs. With the rapid development of faster CPUs, cheaper memory (and lots of it), one could argue that by the time we are ready for Java, the hardware will have caught up with the requirements of the market. But what else will be happening during this development period? Well, companies supplying compiled applications will also be moving forward. Whether there will be a crossover that says Java's advantages outweigh its limitations remains to be seen.

Java's greatest potential is expected to be in electronic commerce. Do Microsoft and others also have designs on supplying this marketplace? (Do bears sleep in the woods?) Let's see. We can write an application once and have it run on Macs and PCs. But it needs a lot of memory and fast CPUs. This doesn't sound like the installed base of 200 million PCs and Macs out there. So we need all new PCs or Macs. This will take ten years or so to be realized.

Microsoft vs. Java and everyone else. What has Microsoft done? Well, for one, it got Sun to initiate a lawsuit claiming that Microsoft's implementation of Java violates the licensing agreement. One would wonder, if Java is so great and the market pressure to make it a universal standard is so economically compelling, why did Sun sue Microsoft? Could it be that Microsoft's attempt to subsume Java (make the Microsoft version of Java "better" than all the others) is working? In addition, Microsoft not only wants to make its own version of Java better. It wants to ensure that whatever Java becomes, it is not a replacement for Windows and Internet Explorer.

The Justice Department has also sued, claiming Microsoft violated its consent decree in bundling Explorer (free) within Windows. Let's see: For electronic commerce to be a simple extension of the desktop (it already is getting there) and the move from the desktop to the Web to be seamless, wouldn't a supplier of these tools want both programs to be so tightly linked as to be invisible to the end user? Isn't that the whole idea?

Summary. Let's summarize. The Justice Department wants Microsoft to behave. (If you really read what it wants, it is for Microsoft to stop performing as well as it has.) Microsoft, backed by end users laying down their money, is giving end users what they want. It also is trying to ensure that it has a future. (Remember, two years ago, when many people felt Microsoft had "missed" the importance of the Web?)

Sun, the long-time manufacturer of proprietary (i.e., not a Mac and not a PC) hardware, wants to survive. So it is trying to subsume the Web with its Java language. (We still find it hilarious that if Java succeeds it will undermine Sun's hardware business. Or does Sun think it has certain inside advantages in making Java run better on its own hardware than on Wintel machines? Is this a conundrum?)

That's what Microsoft is trying to do.

CNI's view. Don't assume from this that CNI wants Microsoft to win. Rather, we are striving to get the best solution for end users. It would be naive for the world (and in particular for Web devotees, who tend not to like Microsoft) to think that Wintel is going away. It's not. It was the Mac-style user interface built upon the Wintel architecture that has provided us with unbelievable functionality. This has advanced human workplace endeavors. Why would one want this to go away?

Let's look at this Justice Department action a little more closely. Can a group of Government lawyers really legislate how software should work and what functionality should be there? If you think so, remember who it was that brought us the $600 U.S. Air Force toilet seat.

When the Government starts to legislate innovation, watch out; we will get large, bulbous, slow, inefficient software. CNI's opinion is that if this were to happen, it would be the only way to get Microsoft to slow down.

Then some offshore supplier (probably off India, since there is an energetic software development culture and industry in that low-wage country) will really clean Microsoft's clock, probably in only one small area of its business. At that point, our Government will relax, realizing that it is going to drive the U.S. out of the competitive software business. That would be most damaging, not to commercial ventures, but to our Defense Department. It is software that allows "smart bombs" to find a target in the middle of Baghdad. The software industry is a high value-added and tactically and strategically important resource for the U.S. to remain in.

What will happen? What do we think will happen? First, high-end applications are simply not going to be rewritten in Java. These programs are simply too well developed and entrenched. We're not going to be running Xpress or Word in Java anytime soon. Second, if Java's performance, especially over the Web, is tolerable, there will be enough momentum behind the language to have "lighter" applications written in Java. These applications are not going to replace Word or Xpress; they'll complement them. (When we want to purchase the latest upgrade of Xpress, we may buy it over the Web using a Java applet.) Just as when C was introduced, some hard-coded assembly language programs were rewritten in C, and, over time, C's natural advantages began to be supported by hardware: cheaper memory, hard-disk storage and CPU speed. (Microsoft's full Office 97 suite comes on a CD taking 650 MB.) Running NT client and applications such as Word and Xpress really requires at least 32 MB of memory. If you're going to do anything serious, 48 MB (or 64) is better.

In the meantime, the battle for control of the Web between Microsoft and everyone else will continue. We predict that if having one desktop OS for your workstation, for your network and for Web-based computing makes the most sense, then Microsoft will be the company to provide it. But if the Web becomes critical for other activity-e.g., "light" applications such as **purchasing** a sports **ticket online** through Ticketron or paying your gas bill using electronic **funds transfer**-control of the Web will be more difficult for Microsoft to achieve.

Windows CE and notebooks. Microsoft's Windows CE technology is aimed squarely at what Java is supposed to do. In short, it is a lighter version of Windows running on network PCs or managed PCs. This energy will diffuse the Java initiative. Microsoft is developing with Citrix a server-based support structure for these machines, called Hydra. Based on the Citrix Winframe technology, it, too, appears to take dead aim at server-based Java applications.

With notebook-computer manufacturers making faster, lighter, less costly machines, capable of running a Web browser, this also will diffuse the Java initiative. Unless the Justice Department stops Microsoft (we see no one else that may be able to), it appears that Microsoft will simply merge Internet Explorer with Windows, leaving no reason to have a separate device besides a Windows-based notebook.

In order for Web browsers to replace the desktop OS, two things must happen. The XML initiative will have to take hold, and Microsoft, in particular, will have to change its internal file formats to be based on XML. Only then would there be no reason to use Windows. And with Microsoft controlling these technologies, it is hard to bet on Java against Windows.

Push technology

Here's a great idea. Let's create a new industry. We'll gather up all the stuff you want to see on your desktop, send it to you and charge a modest amount for the service. CNI calls this publishing. We'll charge for this service so we, as publishers, can stay in business.

Proponents of push technology have tried to do the same thing-only without anyone paying for it. So we see the problem with push technology as one of simple economics. Who is going to pay for this service? And how is it any different from all the other efforts to succeed with E-commerce (i.e., enterprising companies trying to figure out how to get customers to part with their money over the Web)?

Online strategies: Are we Web-aware?

An article in PC Week addressing corporations' online strategy noted that most companies interviewed had no clearly defined strategy yet. If this is so, there will be little economic initiative for a remote computing standard to take hold.

The results of the study were as follows. In their online strategies, companies had several Internet stages:

1. Stealth. No one knew anything.
2. Ad hoc coalition. An informal status exists.
3. An informal Internet commerce group exists.
4. A formal Internet commerce group exists.

A Forrester Research study showed that 42% of companies had no internal cooperation regarding their online strategy. It noted that 28% disagreed over content ownership and 24% had no management leadership.

The value of brands. CNI sees this as an opportunity for well-positioned companies in their existing markets (e.g., newspapers). People looking for information on the Web typically will feel more comfortable with a brand or name they recognize. So the brand awareness of the newspaper can be used to establish an online position in the community. This is why-given equal pricing-more people will use AOL or the Microsoft Network than an independent ISP. It is also why companies, infused with high stock-market valuations, are gobbling each other up: to acquire brand-name recognition in the marketplace.

Other Computer Manufacturers

Last year we mentioned that DEC would have a hard time keeping up with Intel as a hardware manufacturer (especially in CPU chips), as would Silicon Graphics and Sun. In the past year, all three situations have proceeded toward what looks like an unavoidable eventual outcome based on raw economics. When you look at economies of scale, it is hard to imagine that companies as large as DEC, Sun and Silicon Graphics are not large enough to compete. But consider that (1) a wafer fabrication plant can cost $500 million or more to build, (2) the plant must be upgraded continually to remain current, and (3) a chip itself may sell for only $50 or $150.

In that perspective, it becomes very hard to make that size of investment pay off. Add, too, the constant struggle of trying to learn what a larger competitor such as Intel learns in dealing with many more OEM customers. All of this paints a pretty grim picture.

Just this year, Intel announced that its manufacturing processes for CPU chips were going to a narrower run (the width of the etched lines that run between the logic). The reason for this is simple engineering. If the lines are thinner, the distances the electronics have to cover are

reduced, making it possible for the chip to run faster. Since CPU chip speed is now related in part to the propagation speed of electrons, this is an obvious next logical step.

So imagine being a manufacturer that has just modernized or built a new CPU fabrication plant. And suddenly Intel announces that you have to start over. Think of all the manufacturing processes, quality control and simple fabrication technologies that are involved. It kind of gives you a weak stomach for attempting this.

Intel has announced that it will release 400-MHz CPUs in mid-year. Sun is still shipping 150-MHz units of its Sparc, although it has announced 300- to 600-MHz versions.

Intel has also announced a partnership with HP to build the next generation of 64-bit chips. So even Intel is having trouble justifying doing the complete development on new-generation CPU chips without having a partner to share the cost and the risk (not the RISC).

DEC and Intel: Suit, not future, is settled

Earlier last year, DEC sued Intel, claiming Intel had used or misappropriated trade secrets from the DEC Alpha chip in designing certain Intel chips. Intel countered-and in the process raised issues about whether it would continue to sell its CPUs to DEC after its current agreement ran out.

The action raises some interesting issues. DEC is struggling financially. Its Alpha chip is holding onto a small fraction of the market of computer systems being delivered. Its CEO is under pressure to stem the bleeding.

As part of the settlement reached last fall, Intel agreed to purchase the DEC fabrication plant in Massachusetts in which the Alpha chip is made. It also included a long-term supply agreement under which DEC will purchase Intel chips. (It amused us after the settlement to see two stories on the front page of Infoworld, one in which DEC touted the Alpha chip's future and the other an opinion piece suggesting that the Alpha's best days-limited though they were-were behind it.)

If we put these developments in perspective-DEC sells its manufacturing plant to the company it sued and signs a long-term supply agreement for competitive chips-what does it suggest about the future of Alpha chips against Intel's?

Sun: If you can't lick 'em . . .

Sun continues to be perhaps the only serious hardware manufacturer left to challenge Intel as a hardware supplier. We discussed a major portion of Sun's current status under Java (above). Here, in focusing on computer manufacturing, we'll follow the Java path to its logical conclusion.

Suppose Java wins the war against Microsoft and becomes the universal standard in which all future application code is written. In this case, since all application programs would then run on any hardware, why would a purchaser buy anything but the most cost-effective hardware? If this is so, what kind of future will Sun have as a hardware manufacturer?

Sun showed CPUs running at 500 to 600 MHz at Comdex. However, CPU speed is only one measure of system performance. Also critical are the speeds of the bus, the peripherals and the memory chips. In that context, Sun may not be as impressive as it seemed at Comdex-or as it needs to be to compete.

Since the show, we have received an indication that Sun has come to the same conclusions as we have. As we went to press, Sun announced that it will port its Solaris operating system to Intel's new, 64-bit "Merced" chip architecture. If one follows this announcement to its logical

conclusion, Sun has realized it simply can't keep up with Intel in CPU development.

Silicon Graphics: better late than never

The CEO of SGI has just left after several quarters of disappointing performance. That's probably a good time to revisit the company. While SGI has grown to a remarkable size (billions of dollars a year in sales), it has always been a "niche" player. Its original claim to fame was a geometry engine that enabled very fast matrix multiplication-very useful for 3D and 2D vector representations of images. This capability has particular application in generating special effects digitally in movies. In fact, the high-end special-effects houses in Hollywood (e.g., Industrial Light and Magic) would simply not be able to do what they do without fast SGI boxes for rendering. However, with multiple-CPU Intel boxes coming onto the market (for use in desktop PCs as well as in file servers), it will be only a matter of time before more standard Intel-based boxes will be able to keep up. (They already do in dollars per computing cell.)

The MIPS issue. SGI is interesting for another reason. Five years ago, it had to decide whether to build a new CPU chip or buy one from another supplier. At the time, it appeared that a company called MIPS was going to sign a contract locking up DEC's CPU business for RISC chips. Instead, though, DEC decided to build the Alpha (see above). Unfortunately, SGI had already committed its next-generation systems to the MIPS design. So, as MIPS's chances to be a contender in the RISC CPU supply business faded, SGI purchased MIPS. That, in our opinion, sealed MIPS's fate. With only one major OEM customer-which happened also to be its owner-it was going to be very difficult for MIPS (and its owner, SGI) to compete. It just took a while for the inevitable to happen.

Epilog. As a final note to all of this, SGI has announced that it will start making systems based on Intel Pentium II chips. What a brainstorm for this company. Using 20-20 hindsight, it is easy to see SGI starting down this road several years ago-making systems with multiple Pentium CPUs, providing higher-end performance on a standard platform.

Going a step beyond that, if we put on our prognosticator caps for a moment, we at CNI believe that for both Sun and SGI to remain multibillion-dollar manufacturers of leading-edge hardware (able to run Java or Windows very quickly), both companies will have to manufacture systems based on multiple Intel CPUs. This would have been heresy only a few years ago. But CNI sees the inevitability of this technological march forward.

Apple: still a role, but not much good news

This is frightening . . . like watching a car skidding on the ice toward a tree. They announce a huge loss, and that they are **selling** less per quarter.1 **Market** share is declining. Then they pull the clone licenses for the third-party suppliers. They appear to be having trouble recruiting a world-class person to run the company. MacWeek, normally a bastion of good news on the company, just reported that Apple expects its reduced sales compared with previous quarters to continue at least through the second quarter of '98. And, for the first time, CNI is getting requests from newspapers wanting to install display-ad composition systems on PCs-heresy for a newspaper even three years ago. At that time, no one did ad composition on a PC.

Having said all that, CNI still sells Macs every month. The new G3s are fast and cost-effective. With the replacement cycle of high-end machines for prepress applications averaging 18-24 months, no one really thinks that purchasing Macs for workstations is a bad idea. However, we recommend not using Macs for file servers. Build your network around NT, Novell

and even Unix before you use the Mac OS. Otherwise, we suggest you will find yourself with a decreasing circle of products to operate on at the core network level. (Note: Apple has finally removed something from the Mac's feature set. The G3s use IDE-not SCSI-drives. Support for SCSI was one item Mac supporters always trumpeted over PCs.)

Apple is still very fast on its feet when it sees an opportunity. At Macworld this summer (before Comdex), interim CEO Steve Jobs announced Microsoft's investment in Apple on the opening day. And, lickety-split, you couldn't find a Mac at the show running Netscape Navigator. All the Macs in the Apple booth (and there were hundreds) were running Internet Explorer. At previous Macworlds, you couldn't find a Mac running Explorer. It's funny how much-and how quickly-money motivates.

The clones. Does anyone remember the original IBM PC? IBM did such a great job of making it a standard that companies cloned the entire machine. So IBM, with its own form of brilliance (some say arrogance), tried to take it back with the PS/2, built around IBM's own (and "better") Micro Channel Architecture.

We might remind Apple that those who don't study history are doomed to repeat it. Has anyone tried to buy a PS/2 recently? They're in the dumpster. The rest of the world simply thumbed its nose at IBM and pushed the existing open PC standard to its next level.

If Apple isn't careful, its hardware business will wind up in the same place. One difference here is that Apple has a larger following, including our industry, than IBM did among its corporate clients when IBM tried to take back the PC. All this will mean is that it will take Apple hardware (the Mac) longer to trail off.

It surprised us at CNI that Apple's pulling of the clone licenses didn't generate more legal heat. But that may be starting. It took until late in December, but PowerTools, a prospective clone manufacturer, has sued Apple, claiming that the change in license terms has harmed this clone wannabe.

Rhapsody for the PC? Rhapsody will run Mac programs on Intel hardware. Why would you want to run Mac programs more slowly on an Intel platform, when the same programs are available running natively under Windows? Maybe some PC hardware manufacturers will bundle Rhapsody on their Intel-based machines, but they would also probably include Windows.

Targeting Dell. Another curious position raised by Jobs was his comment that Dell is now number 1 on Apple's most wanted list. (Michael Dell's response: "Foolish.")

So, let's think this thing through. Apple is losing the desktop battle. It is starting to lose the educational market (one of its big 3), it's losing market share in the home market (another of the big 3) and some of its loyal customers in the prepress market (the last of the big 3) are starting to abandon it. So Apple is going to take this back by going direct to purchasers through mail order.

In balance. Again, don't misunderstand us. CNI sells Macs every month as workstations. But this company's marketing missteps-its development of great concepts and technology, with a five-year lead on Microsoft, and ending up where it is now-should be High-Tech Case Study Number One at every business school.

We wish Apple well, but we agree with Jobs in his comment in a television interview when asked about hiring John Sculley to run Apple during Jobs's first term there. His answer: "I hired the wrong guy."

News from the Not-Macworld show. As we went to press, the Macworld show had just concluded in San Francisco. We were interested to note, for the first time, it was featuring Apple's major competitors selling "not Mac" solutions. DEC and Intergraph are both selling high-end NT workstations as an alternative to Macs. Silicon Graphics (which, we have noted above, is going to start shipping Intel boxes) is pushing its MIPS-based SGI machines running its own version of Unix.

We find it a bit ironic that this featured Mac exposition has vendors on the show floor trying to bring down the reason for the show. Do you suppose the show organizers could have denied them floor space on the grounds of not fitting in with the objective of the show?

Chip Development: Keeping Up with the Groves

AMD has been trying (through lower costs) to keep current with Intel. We see many PC clone makers using the AMD unit at the low end (in Pentium systems, like a P166). In fact, the CPU is not called a P166 if it's not from Intel. Some CNI clients insist on guarantees that they won't have operational problems using the AMD chip. We have seen none to date. However, since Intel is teaming with HP on the newer 64-bit architectures, we wonder if AMD or Cyrix will be able to keep pace.

The Pentium II chip has been Intel's replacement for the standard Pentium Pro. The Pentium Pro offers clock speeds of up to 200 MHz, while the P II chips start at 233 MHz and presently climb through 266 MHz to the released 300-MHz version. The current release of the Pentium II chip will support multiprocessing for two CPUs. The next generation of the Pentium II (code-named Deschutes) will support multiple CPUs (the Pentium Pro also supports multiple CPUs). Units with a starting speed of 333 MHz will be released during the first quarter of this year. In the second quarter, Intel will begin its releases of the Mobile Pentium II processor, a 350-MHz Pentium II and a 100-MHz system bus. Expect Intel to ramp up its production line and blast the Pentium II deeper in the market as competitors gain some momentum with releases from AMD and Cyrix.

The third quarter will yield yet another Pentium II release at the 400-MHz speed and round out the year with a Plus version of the 400-MHz processor that will incorporate a special 3D instruction set to boost video performance further.

What lies ahead from Intel is quite interesting. Between 1999 and 2000, Intel is expected to release the successor to the Pentium II (code-name "Willamette"), a near-600-MHz processor and an 800-MHz version ("Merced").

In order for even Intel to justify this level of investment, it is teaming up with HP on the 64-bit CPU architecture. That is very revealing. If the largest, mightiest supplier of CPUs needs a business partner to underwrite some of the risk or cost, that tells us no one will be able to keep up with Intel.

RISC vs. CISC

Has anyone heard anything recently about RISC CPUs taking over the computer industry? It would appear that no matter what technological superiority RISC may have had over CISC, it has vaporized with Intel's relentless advances in price-performance terms. In other words, the performance benefit of reducing the instruction set, in comparison to simply making the CPU with a full instruction set run faster, isn't significant in providing a better return for the chip OEM customers. This is further proof that you simply can't keep up with Intel-and with the sheer

economies of scale Intel realizes by making millions of CPU chips.

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1 One good thing coming out of that era was that General Motors was so successful under Alfred P. Sloan (let the people buy any car, as long as it's from General Motors) that Sloan was able to endow the management school at MIT. MIT itself was an outgrowth of Harvard University by a disgruntled student unsatisfied with the technical education at Harvard. That student rambled down the Charles River to start MIT. So here is a case where complete market domination in one field created competition in another field.

1 WorldCom was started in Mississippi as a reseller of long-distance service-one of the "closet" long-distance remarketers.

3 Cervo was one of the original developers at Atex during its high-growth years. Then he was a senior development person at Interleaf in its formative years. He also had a stint at Xyquest (developer of Xywrite). Cervo has now done an editing system for the fourth time. If anyone should have an opinion on this technology, he should be it.

1 Since this article was written, Apple announced an anticipated profit of $45 million for its first quarter, although revenues will decline from $2.1 billion a year ago to $1.6 billion.

To be continued . . .

In Part II in our next issue, Mike Gold will conclude with a look at certain aspects of prepress integration, including the use of groupware to build systems, the continuing merger of computers with communications and entertainment, and the role of PDF in our future. In addition, a section on new technology will discuss the latest developments in CD-ROM and DVD technology.

For readers unfamiliar with this ongoing series, Mike Gold is the president of Computer Network Integrators (CNI), a system integrator primarily serving the newspaper market. Every fall CNI sends a crew of technicians to Comdex to observe and evaluate the latest hardware and software developments. The objective is to discover the resources available to CNI's integrators and to get an advance look at future trends that may help their business. CNI's contact information is on page 17.